

CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A composition for forming electrical interconnect, comprising:
 - a metal or metal alloy powder composed of a plurality of particles of a particle size of 500 nm or less;
 - a dispersant associated with particles of the metal or metal alloy powder, said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said particles of the metal or metal alloy powder; and
 - a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy powder.
2. The composition of claim 1 wherein said particle size is 100 nm or less.
3. The composition of claim 1 wherein said metal or metal alloy is silver or a silver alloy.
4. The composition of claim 1 wherein the dispersant is a fatty acid or a fish oil.
5. The composition of claim 1 wherein said binder is a polymeric material.
6. The composition of claim 1 further comprising a viscosity adjusting component.
7. A method for forming an interconnect which performs at least one of mechanically, thermally or electrically connecting a device to a substrate, comprising the step of:

sintering metal or metal alloy particles that have a size of 500 nm or less which are positioned on contacts on the device and the substrate and sandwiched therebetween, said sintering step forming a metal or metal alloy layer from said metal or metal alloy particles which performs one or more of mechanically, thermally, or electrically interconnecting the device and the substrate.

8. The method of claim 7 further comprising the step of depositing on at least one electrical contact of at least one of the device and the substrate said metal or metal alloy particles.
9. The method of claim 8 wherein said step of depositing is performed by screening, printing or stenciling.
10. The method of claim 7 wherein said metal or metal alloy particles are of a size of 100 nm or less.
11. The method of claim 7 further comprising the step of holding the device and the substrate together during the step of sintering.
12. The method of claim 7 wherein said metal or metal alloy is silver or silver alloy.
13. The method of claim 7 wherein said metal or metal alloy, prior to said step of sintering, is present in the form of a paste which comprises a dispersant associated with the metal or metal alloy particles, said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said metal or metal alloy particles, and a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy particles.

14. A method for connecting a substrate and a device, comprising:
 - positioning a paste between contacts of said substrate and said device which comprises a metal or metal alloy powder composed of a plurality of particles of a particle size of 500 nm or less, a dispersant associated with particles of the metal or metal alloy powder, said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said particles of the metal or metal alloy powder, and a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy powder; and
 - heating said paste to a temperature and for a time sufficient to remove said binder and said dispersant, and to sinter metal particles of said metal or metal alloy powder together to form a metal or metal alloy layer from said metal or metal alloy particles which performs at least one of mechanically, thermally, or electrically interconnecting the device and the substrate.
15. The method of claim 14 wherein said metal or metal alloy is silver or silver alloy.
16. The method of claim 14 wherein said particles are 100 nm or less in size.
17. The method of claim 14 wherein said positioning step is performed by stenciling, printing, or screening.
18. The method of claim 14 further comprising the step of selecting said binder in said paste based on a desired temperature of volatilization.
19. The method of claim 14 further comprising the step of isolating said metal or metal alloy particles with said binder until a preset temperature during said heating step, wherein said preset temperature is determined

based on said binder and a sintering temperature for said metal or metal alloy particles.

20. The method of claim 19 wherein said preset temperature is the same as or slightly below a sintering temperature for said metal or metal alloy particles.